AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Canceled)

2. (Currently amended) The method of claim [[1]] 11, wherein the generating the color profile further comprises increasing image processing precision by fitting output to input data scopes between ~~the~~ two or more stages of the multistage transform based on the parameterized encoding of the image.

3. (Currently amended) The method of claim 2, wherein the generating the color profile further comprises affecting ~~three~~ stages~~, which include the two stages,~~ of the multistage transform such that the color profile ~~effects chromatic adaptation according to the white point and~~ transcodes the image component according to the range and the offset; and the fitting comprises fitting output to input data scopes among the ~~three~~ stages.

4. (Original) The method of claim 3, wherein the image parameters of the parameterized encoding define ranges, offsets, and bit depths of image components of the image, and the color profile comprises a bit-depth independent color profile.

5. (Currently amended) The method of claim 2, wherein the affecting the two or more stages comprises taking into account at least a portion of the image parameters within a middle stage of a transform-defining element of the defined color profile architecture, the transform-defining element comprising at least three stages and at most five stages.

6. (Original) The method of claim 5, wherein the image color space comprises a CIELAB color space, and the profile connection space comprises a CIEXYZ color space.

7. (Original) The method of claim 6, wherein the defined color profile architecture comprises an International Color Consortium color profile architecture, and the transform-defining element comprises a lutAtoB tag.

8. (Canceled)

9. (Canceled)

10. (Canceled)

11. (Currently amended) ~~The~~ A machine-implemented method ~~of claim 10,~~ comprising:

generating a color profile that conforms to a defined color profile architecture and that defines a multistage transform capable of translating an image color space to a profile connection color space;

receiving an image;

processing the image using the color profile; and

outputting the image to an electronic device; wherein the generating, the receiving, the processing and the outputting are performed by at least one processor, and wherein

the image comprises a parameterized encoding of the image color space with image parameters defining a range and an offset of an image component of the image, and a white point of the image color space; and

the generating the color profile comprises affecting two or more stages of the multistage transform based on the image parameters during the generating of the color profile, the affecting comprising:

determining a first processing stage of a transform-defining element of the defined color profile architecture, wherein the first processing stage comprises a multidimensional interpolation table that governs commingling of image channels and accounts for the range and the offset, and wherein the determining the first processing stage comprises making entries of the multidimensional interpolation table positive[[,]] and normalizing the entries in the multidimensional interpolation table;

determining a second processing stage of the transform-defining element, wherein the second processing stage comprises one dimensional transforms and defines at least a portion of a conversion of the image color space to a chromatic adaptation color space, and wherein the determining the second processing stage comprises generating a second processing stage that denormalizes output of the first processing stage, applies a nonlinear function[[,]] and scales by a scaling factor; and

determining a third processing stage of the transform-defining element, wherein the third processing stage comprises a matrix and defines a chromatic adaptation in the chromatic adaptation color space according to the white point, and wherein the

determining the third processing stage comprises generating a third processing stage that denormalizes output of the second processing stage[[,]] and performs the chromatic adaptation.

12. (Original) The method of claim 11, wherein the multidimensional interpolation table comprises a 2x2x2 multidimensional interpolation table, and the third processing stage also maps a black point of the image color space to a perceptual intent black of the defined color profile architecture.

13. (Canceled)

14. (Canceled)

15. (Currently amended) ~~The~~ A machine-implemented method ~~of claim 14,~~ comprising:

generating a color profile that conforms to a defined color profile architecture and that defines a multistage transform capable of translating an image color space to a profile connection color space;

receiving an image;

processing the image using the color profile; and

outputting the image to an electronic device; wherein the generating, the receiving, the processing and the outputting are performed by at least one processor, and wherein

the image comprises a parameterized encoding of the image color space with image parameters defining a range and an offset of an image component of the image, and a white point of the image color space; and

the generating the color profile comprises affecting two or more stages of the multistage transform based on the image parameters during the generating of the color profile, the affecting comprising:

determining a first processing stage of a transform-defining element of the defined color profile architecture, wherein the first processing stage comprises a multidimensional interpolation table that governs commingling of image channels and accounts for the range, and wherein the determining the first processing stage comprises negating a channel of the image color space[[,]] and swapping rows in the multidimensional interpolation table having a 1 in the channel with rows in the multidimensional interpolation table having a 0 in the channel;

determining a second processing stage of the transform-defining element, wherein the second processing stage comprises one dimensional transforms and accounts for the offset and defines at least a portion of a conversion of the image color space to a chromatic adaptation color space, and wherein the determining the second processing stage comprises generating a second processing stage that applies a nonlinear function[[,]] and applies the offset; and

determining a third processing stage of the transform-defining element, wherein the third processing stage comprises a matrix and defines a chromatic adaptation

in the chromatic adaptation color space according to the white point, and wherein the determining the third processing stage comprises generating a third processing stage that denormalizes output of the second processing stage[[,]] and performs the chromatic adaptation.

16. (Original) The method of claim 15, wherein the multidimensional interpolation table comprises a 2x2x2 multidimensional interpolation table, and the third processing stage also maps a black point of the parameterized color space to a perceptual intent black of the defined color profile architecture.

17. (Currently amended) The method of claim [[1]] 11, wherein the processing the image using the color profile comprises embedding the color profile in the image, and the outputting the image comprises saving the image to a storage device.

18. (Currently amended) The method of claim [[1]] 11, wherein the processing the image using the color profile comprises transforming the image from the image color space to a working color space, and the outputting the image comprises saving the image to a memory device.

19. (Canceled)

20. (Currently amended) The storage device of claim [[19]] 29, wherein the generating the color profile further comprises increasing image processing precision by fitting output to input data scopes between ~~the~~ two or more stages of the multistage transform based on the parameterized encoding of the image.

21. (Currently amended) The storage device of claim 20, wherein the generating the color profile further comprises affecting ~~three~~ stages~~, which include the two stages,~~ of the multistage transform such that the color profile ~~effects chromatic adaptation according to the white point and~~ transcodes the image component according to the range and the offset; and the fitting comprises fitting output to input data scopes among the ~~three~~ stages.

22. (Previously Presented) The storage device of claim 21, wherein the image parameters of the parameterized encoding define ranges, offsets, and bit depths of image components of the image, and the color profile comprises a bit-depth independent color profile.

23. (Currently amended) The storage device of claim 20, wherein the affecting the two or more stages comprises taking into account at least a portion of the image parameters within a middle stage of a transform-defining element of the defined color profile architecture, the transform-defining element comprising at least three stages and at most five stages.

24. (Previously Presented) The storage device of claim 23, wherein the image color space comprises a CIELAB color space, and the profile connection space comprises a CIEXYZ color space.

25. (Previously Presented) The storage device of claim 24, wherein the defined color profile architecture comprises an International Color Consortium color profile architecture, and the transform-defining element comprises a lutAtoB tag.

26. (Canceled)

27. (Canceled)

28. (Canceled)

29. (Currently amended) A ~~The~~ storage device ~~of claim 28,~~ having a software product tangibly embodied therein, the software product comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

generating a color profile that conforms to a defined color profile architecture and that defines a multistage transform capable of translating an image color space to a profile connection color space;

receiving an image;

processing the image using the color profile; and

outputting the image; wherein

the image comprises a parameterized encoding of the image color space with image parameters defining a range and an offset of an image component of the image, and a white point of the image color space; and

the generating the color profile comprises affecting two or more stages of the multistage transform based on the image parameters during the generating of the color profile, the affecting comprising:

determining a first processing stage of a transform-defining element of the defined color profile architecture, wherein the first processing stage comprises a multidimensional interpolation table that governs commingling of image channels and accounts for the range and the offset, and wherein the determining the first processing stage comprises making entries of the multidimensional interpolation table positive[[,]] and normalizing the entries in the multidimensional interpolation table;

determining a second processing stage of the transform-defining element, wherein the second processing stage comprises one dimensional transforms and defines at least a portion of a conversion of the image color space to a chromatic adaptation color space, and wherein the determining the second processing stage comprises generating a second processing stage that denormalizes output of the first processing stage, applies a nonlinear function[[,]] and scales by a scaling factor; and

determining a third processing stage of the transform-defining element, wherein the third processing stage comprises a matrix and defines a chromatic adaptation

in the chromatic adaptation color space according to the white point, and wherein the determining the third processing stage comprises generating a third processing stage that denormalizes output of the second processing stage[[,]] and performs the chromatic adaptation.

30. (Previously presented) The storage device of claim 29, wherein the multidimensional interpolation table comprises a 2x2x2 multidimensional interpolation table, and the third processing stage also maps a black point of the image color space to a perceptual intent black of the defined color profile architecture.

31. (Canceled)

32. (Canceled)

33. (Currently amended) ~~The~~ A storage device ~~of claim 32,~~ having a software product tangibly embodied therein, the software product comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

generating a color profile that conforms to a defined color profile architecture and that defines a multistage transform capable of translating an image color space to a profile connection color space;

receiving an image;

processing the image using the color profile; and

outputting the image; wherein

the image comprises a parameterized encoding of the image color space with image parameters defining a range and an offset of an image component of the image, and a white point of the image color space; and

the generating the color profile comprises affecting two or more stages of the multistage transform based on the image parameters during the generating of the color profile, the affecting comprising:

determining a first processing stage of a transform-defining element of the defined color profile architecture, wherein the first processing stage comprises a multidimensional interpolation table that governs commingling of image channels and accounts for the range, and wherein the determining the first processing stage comprises negating a channel of the image color space[[,]] and swapping rows in the multidimensional interpolation table having a 1 in the channel with rows in the multidimensional interpolation table having a 0 in the channel;

determining a second processing stage of the transform-defining element, wherein the second processing stage comprises one dimensional transforms and accounts for the offset and defines at least a portion of a conversion of the image color space to a chromatic adaptation color space, and wherein the determining the second processing stage comprises generating a second processing stage that applies a nonlinear function[[,]] and applies the offset; and

determining a third processing stage of the transform-defining element,

wherein the third processing stage comprises a matrix and defines a chromatic adaptation in the chromatic adaptation color space according to the white point, and wherein the determining the third processing stage comprises generating a third processing stage that denormalizes output of the second processing stage[[,]] and performs the chromatic adaptation.

34. (Previously presented) The storage device of claim 33, wherein the multidimensional interpolation table comprises a 2x2x2 multidimensional interpolation table, and the third processing stage also maps a black point of the parameterized color space to a perceptual intent black of the defined color profile architecture.

35. (Currently amended) The storage device of claim [[19]] 29, wherein the processing the image using the color profile comprises embedding the color profile in the image, and the outputting the image comprises saving the image to a storage device.

36. (Currently amended) The storage device of claim [[19]] 29, wherein the processing the image using the color profile comprises transforming the image from the image color space to a working color space, and the outputting the image comprises saving the image to a memory device.

37. (Previously presented) A system comprising:

a device; and

a data processing machine comprising an input-output interface, an operating system, and a color management software component that generates a bit-depth independent color profile for an image comprising a parameterized encoding of an image color space with image parameters defining ranges, offsets and bit depths of image components of the image, wherein the color management software component generates the color profile by representing a transformation comprising a matrix followed by curves in a pipeline of a defined color profile architecture while increasing processing precision governed by the color profile based on the parameterized encoding, and wherein the color management software component is operable to use the curves to (i) denormalize output of the matrix, apply a nonlinear conversion function and scale by a scaling factor, when non-canonical offsets are applied in the matrix, and otherwise (ii) denormalize output of the matrix, apply a nonlinear conversion function and apply non-canonical offsets.

38. (Previously presented) The system of claim 37, wherein the image parameters further define a white point of the image color space, and the transformation comprises the matrix followed by the curves followed by an additional matrix, the additional matrix to denormalize curve output and apply a parameterized chromatic adaptation.

39. (Original) The system of claim 38,wherein the color profile effects chromatic adaptation according to the white point and transcodes the image components according to the ranges and the offsets, in at least three stages of the pipeline.

40. (Original) The system of claim 39, wherein the color profile transcodes the image components in a multidimensional interpolation table stage and a one dimensional transforms stage of the pipeline, and the color profile effects chromatic adaptation in a matrix stage of the pipeline.

41. (Original) The system of claim 37, wherein the device comprises a display integrated with the data processing machine.

42. (Currently amended) A machine-implemented method comprising:

improving color accuracy of conversion of an image color space of an image by affecting two or more processing stage definitions of a transform-defining element in a color profile associated with a defined image processing pipeline, based on image parameters, such that the defined image processing pipeline transcodes an image component according to a range and an offset, the two or more processing stage definitions being affected during generation of the color profile, and the affecting comprising defining a mapping of the range and the offset in a multidimensional interpolation table stage of the transform-defining element and fitting output to input data scopes between two of the processing stage definitions, and the image comprising a parameterized encoding of the image color space with the image parameters defining the range and the offset of the image component of the image;

processing, by at least one processor, the image using the defined image processing pipeline; and

outputting the processed image to an electronic device.

43. (Original) The method of claim 42, wherein the image parameters further define a white point of the image color space, and the affecting comprises affecting three or more processing stage definitions for the defined image processing pipeline, based on the image parameters, such that the defined image processing pipeline transcodes the image component according to the range and the offset, and effects chromatic adaptation according to the white point.

44. (Currently amended) A storage device having a software product tangibly embodied therein, the software product comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

improving color accuracy of conversion of an image color space of an image by affecting two or more processing stage definitions of a transform-defining element in a color profile associated with a defined image processing pipeline, based on image parameters, such that the defined image processing pipeline transcodes an image component according to a range and an offset, the two or more processing stage definitions being affected during generation of the color profile, and the affecting comprising defining a mapping of the range and the offset in a multidimensional interpolation table stage of the transform-defining element and fitting output to input data scopes between two of the processing stage definitions, and the image comprising a parameterized encoding of the image color space with the image parameters defining the range and the offset of the image component of the image.

45. (Previously presented) The storage device of claim 44, wherein the image parameters further define a white point of the image color space, and the affecting comprises affecting three or more processing stage definitions for the defined image processing pipeline, based on the image parameters, such that the defined image processing pipeline transcodes the image component according to the range and the offset, and effects chromatic adaptation according to the white point.

46. (Currently amended) An apparatus comprising:

means for receiving an image comprising a parameterized encoding of an image color space with image parameters defining a range and an offset of an image component of the image; and

means for taking image parameters into account across two or more processing stage definitions of a transform-defining element in a color profile associated with a defined image processing pipeline during generation of the color profile for the image, such that the color profile transcodes the image component according to the range and the offset, and the means for taking image parameters into account includes means for defining a mapping of the range and the offset in a multidimensional interpolation table stage of the transform-defining element and means for fitting output to input data scopes between one stage and a subsequent stage of the defined image processing pipeline to increase precision.

47. (Previously presented) The apparatus of claim 46, wherein the image parameters further define a white point of the image color space, and the means for taking the image parameters into account comprises means for taking the image parameters into account across three or more processing stage definitions of the transform-defining element in the color profile associated with the defined image processing pipeline during generation of the color profile for the image, such that the color profile transcodes the image component according to the range and the offset, and effects chromatic adaptation according to the white point.

48. (New) The method of claim 42, wherein the affecting comprises making entries of the multidimensional interpolation table positive and normalizing the entries in the multidimensional interpolation table.

49. (New) The method of claim 48, wherein the affecting further comprises:

generating a second processing stage that denormalizes output of the first processing stage, applies a nonlinear function and scales by a scaling factor; and

generating a third processing stage that denormalizes output of the second processing stage and performs the chromatic adaptation.

50. (New) The storage device of claim 44, wherein the affecting comprises making entries of the multidimensional interpolation table positive and normalizing the entries in the multidimensional interpolation table.

51. (New) The storage device of claim 50, wherein the affecting further comprises:

generating a second processing stage that denormalizes output of the first processing stage, applies a nonlinear function and scales by a scaling factor; and

generating a third processing stage that denormalizes output of the second processing stage and performs the chromatic adaptation.

52. (New) The apparatus of claim 46, wherein the means for taking image parameters into account comprises means for making entries of the multidimensional interpolation table positive and normalizing the entries in the multidimensional interpolation table.

53. (New) The apparatus of claim 52, wherein the means for taking image parameters into account further includes:

means for generating a second processing stage that denormalizes output of the first processing stage, applies a nonlinear function and scales by a scaling factor; and

means for generating a third processing stage that denormalizes output of the second processing stage and performs the chromatic adaptation.

54. (New) The method of claim 15, wherein the generating the color profile further comprises increasing image processing precision by fitting output to input data scopes between two or more stages of the multistage transform based on the parameterized encoding of the image.

55. (New) The method of claim 54, wherein the generating the color profile further comprises affecting stages of the multistage transform such that the color profile transcodes the image component according to the range and the offset; and the fitting comprises fitting output to input data scopes among the stages.

56. (New) The method of claim 55, wherein the image parameters of the parameterized encoding define ranges, offsets, and bit depths of image components of the image, and the color profile comprises a bit-depth independent color profile.

57. (New) The method of claim 54, wherein the affecting the two or more stages comprises taking into account at least a portion of the image parameters within a middle stage of a transform-defining element of the defined color profile architecture, the transform-defining element comprising at least three stages and at most five stages.

58. (New) The method of claim 57, wherein the image color space comprises a CIELAB color space, and the profile connection space comprises a CIEXYZ color space.

59. (New) The method of claim 58, wherein the defined color profile architecture comprises an International Color Consortium color profile architecture, and the transform-defining element comprises a lutAtoB tag.

60. (New) The method of claim 15, wherein the processing the image using the color profile comprises embedding the color profile in the image, and the outputting the image comprises saving the image to a storage device.

61. (New) The method of claim 15, wherein the processing the image using the color profile comprises transforming the image from the image color space to a working color space, and the outputting the image comprises saving the image to a memory device.

62. (New) The storage device of claim 33, wherein the generating the color profile further comprises increasing image processing precision by fitting output to input data scopes between two or more stages of the multistage transform based on the parameterized encoding of the image.

63. (New) The storage device of claim 62, wherein the generating the color profile further comprises affecting stages of the multistage transform such that the color profile transcodes the image component according to the range and the offset; and the fitting comprises fitting output to input data scopes among the stages.

64. (New) The storage device of claim 63, wherein the image parameters of the parameterized encoding define ranges, offsets, and bit depths of image components of the image, and the color profile comprises a bit-depth independent color profile.

65. (New) The storage device of claim 62, wherein the affecting the two or more stages comprises taking into account at least a portion of the image parameters within a middle stage of a transform-defining element of the defined color profile architecture, the transform-defining element comprising at least three stages and at most five stages.

66. (New) The storage device of claim 65, wherein the image color space comprises a CIELAB color space, and the profile connection space comprises a CIEXYZ color space.

67. (New) The storage device of claim 66, wherein the defined color profile architecture comprises an International Color Consortium color profile architecture, and the transform-defining element comprises a lutAtoB tag.

68. (New) The storage device of claim 33, wherein the processing the image using the color profile comprises embedding the color profile in the image, and the outputting the image comprises saving the image to a storage device.

69. (New) The storage device of claim 33, wherein the processing the image using the color profile comprises transforming the image from the image color space to a working color space, and the outputting the image comprises saving the image to a memory device.